Bumble bees of the Susa Valley (Hymenoptera Apidae)

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Bumble bees of the Susa Valley (Hymenoptera Apidae)

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Abstract

A survey of bumble bees (*Bombus* Latreille) of the Susa Valley was conducted at 124 locations between 340 and 3,130 m a.s.l. representative of the whole territory, which lies within the Cottian Central Alps, the Northern Cottian Alps, and the South-eastern Graian Alps. Altogether 1,102 specimens were collected and determined (180 queens, 227 males, and 695 workers) belonging to 30 species - two of which are represented by two subspecies - which account for 70% of those known in Italy, demonstrating the particular value of the area examined with regard to environmental quality and biodiversity. *Bombus soroeensis* (F.), *Bombus mesomelas* Gerstaecker, *Bombus ruderarius* (Mueller), *Bombus monticola* Smith, *Bombus pratorum* (L.), *Bombus lucorum* (L.), *Bombus terrestris* (L.), and *Bombus lapidarius* (L.) can be considered predominant, each one representing more than 5% of the collected specimens, 12 species are rather common (1-5% of specimens) and the remaining nine rare (less than 1%). A list of collected specimens with collection localities and dates is provided. To illustrate more clearly the altitudinal distribution of the different species, the capture locations were grouped by altitude. 83.5% of the samples is also provided with data on the plant on which they were collected, comprising a total of 52 plant genera within 20 plant families. The eight predominant *Bombus* species point out remarkable differences in botanical choices, in fact only three genera (*Epilobium*, *Onobrychis*, and *Trifolium*) were visited by all eight species, and showed very different frequencies between the species.

Key words: altitude, *Bombus*, flora visited, mountain species, western Alps.

Introduction

The genus *Bombus sensu lato* Latreille 1802 (Hymenoptera Apidae), comprising about 240 species present in most continents, is distributed mainly in areas of Europe, Asia and North America with a cold and temperate climate (Williams, 1998; Benton, 2006). The bumble bees are the only social insect whose distribution extends up to the Arctic regions, where bumblebees are characterized by active nest temperature control and increased pilosity that make them well adapted to the cold (Pouvreau, 1984).

As regards the altitudinal range, bumble bees are present from sea level up to 4,250 m a.s.l., varying considerably in size and density of the pubescence. However, although the species of high altitudes are generally more hairy, it is not clear if there is a correlation between hairiness and altitude (Pouvreau, 1984).

Bumble bees are an important component of ecosystems and their pollinating activity is essential for the conservation of many plant species. Really because their presence depends on the abundance and diversity of flora, they are useful indicators of environmental health (Macdonald, 2003). In the global decline in biodiversity, bees are not the exception, unfortunately. The decline, triggered by habitat fragmentation and loss of useful flora, is now documented in Europe especially for social bee species (Williams, 1986; Westrich, 1989; Banaszak, 1995; Biesmeijer *et al*., 2006; Fitzpatrick *et al*., 2007; Kosior *et al*., 2007; Williams *et al*., 2007).

Information available on the Italian bumble bee fauna is less than that relative to other countries; therefore it is difficult to point out changes in the distribution and in the abundance of bumble bees in Italy. Records up to 1995 were assembled by Intoppa *et al*. (1995) and were recently reviewed along with later research (Intoppa *et al*., 2009), but further investigations are much needed; these studies show however unequivocally that 5 of the 43 species recorded in Italy have not been found lately anymore.

In Italy, although there are bumble bee subspecies typical of the South and the islands, the number of taxa present in the North is higher because of the species with a boreal-alpine distribution and of those living in the mountains at medium and/or high altitudes, that can thus be defined as "orophilous". The distribution of such species is clearly affected by the altitude, as already proved by Pittioni (1938) and confirmed by the very rich literature afterwards; a recent review of this matter is given by the papers by Iserbyt *et al.* (2008) and Iserbyt (2009), and the references they quote. In Piedmont (North-western Italy), this phenomenon was highlighted for the "Waldensian Valleys" of the Cottian Alps, on the basis of collections made between 1946 and 1970, by Comba (1960 and 1972) and Comba and Comba (2001).

The wide variability of geo-morphological and climatic conditions of the Alps, and their level of anthropogenic disturbance, suggested extending the observations to a contiguous area. This was done by choosing the Susa Valley for its extensive and complex hydrographic network, the significant elevation difference between the valley and the highest peaks, the large extensions of alpine meadows and the ease of access also to high elevations. Moreover, the bumble bee fauna on the morainic hills at the valley outlet in the high Piedmontese plain had been recently investigated (Quaranta *et al.*, 2004).

The territory is located in the Central Cottian Alps, in the Northern Cottian Alps, and the South-eastern Graian Alps (Marazzi, 2005). On the basis of the geomorphological evolution, it can be divided into three segments: High Susa Valley upstream of Oulx, Middle Susa Valley between Oulx and Susa, and Lower Susa

Valley, between Susa and the valley outlet. In the main valley, which has a curved course with an approximately east-west direction, the river Dora Riparia flows, into which, leaving out the smaller hydrographic network, three secondary branches flow: the Dora di Bardonecchia, fueled in its initial part by the streams coming from Vallée Etroite and Valle di Rochemolles; the Dora di Cesana, formed by the streams Ripa and Thuras, and the stream Cenischia. The river basin, covering an area of 1,261 km^2, extends from 3,538 m a.s.l. of the Rocciamelone - also placed in an eccentric position with respect to the course of the river - to 300 m a.s.l. of the valley outlet. The highest peaks, on which the dorsal watershed separating the valley from the adjacent basins is articulated, often include relief exceeding 3,000 m a.s.l..

Materials and methods

The area in which the study was conducted includes the entire valley of the Dora Riparia, which is currently divided into the mountain communities of Alta Valle di Susa and Bassa Valle di Susa and Val Cenischia and politically in some territories belonging to France (basin of Mont Cenis, Col de Mongenèvre and Vallée Etroite). Some small areas, which are located along the watershed between the valley of the Dora Riparia and that of the Chisone, but included in the catchment area of the latter, have also been taken into account in the municipal districts of Usseaux and Pragelato.

Observations and collections were made from 2001 to 2006 during visits that have taken place in spring and summer, consistent with the climatic conditions and the growth of the flora, in 114 sites representative of the whole territory (figure 1); 94 sites were visited only once, the others twice or more (table 1). On the occasion of each visit to each site, bumble bees showing different colour patterns (Intoppa, 2000) were sampled; whenever possible some specimens of each colour pattern were collected.

In the course of investigations conducted in Susa Valley over the years 1973, 1976-'77, 1984-'85 and 1993, 89 specimens of bumble bees had been collected in 12 sites. They were kept in the collection of Di.Va.P.R.A. and the relative data were added and processed together with the 2001-2006 data to obtain a more complete species list for the valley. They are presented here even though some were previously included in the catalogue by Intoppa *et al*. (1995): i.e. three records of 1973, relating to the municipality of Rubiana, and other specimens, collected in the years 1984-'85, reported with the generic location "Valle di Susa".

For each bumble bee, capture date and location were recorded; the latter was georeferenced to determine altitude and UTM WGS84 co-ordinates. Where possible, the plant on which the bumble bee was foraging was collected and determined by reference to Aeschimann *et al*. (2004).

The classification up to the generic level was made referring to Michener (2000); for the subdivision into subgenera the simplified classification proposed by Williams *et al*. (2008) was followed, while for the identification of species and subspecies and the relative nomenclature the work by Intoppa *et al.* (2009) was adopted.

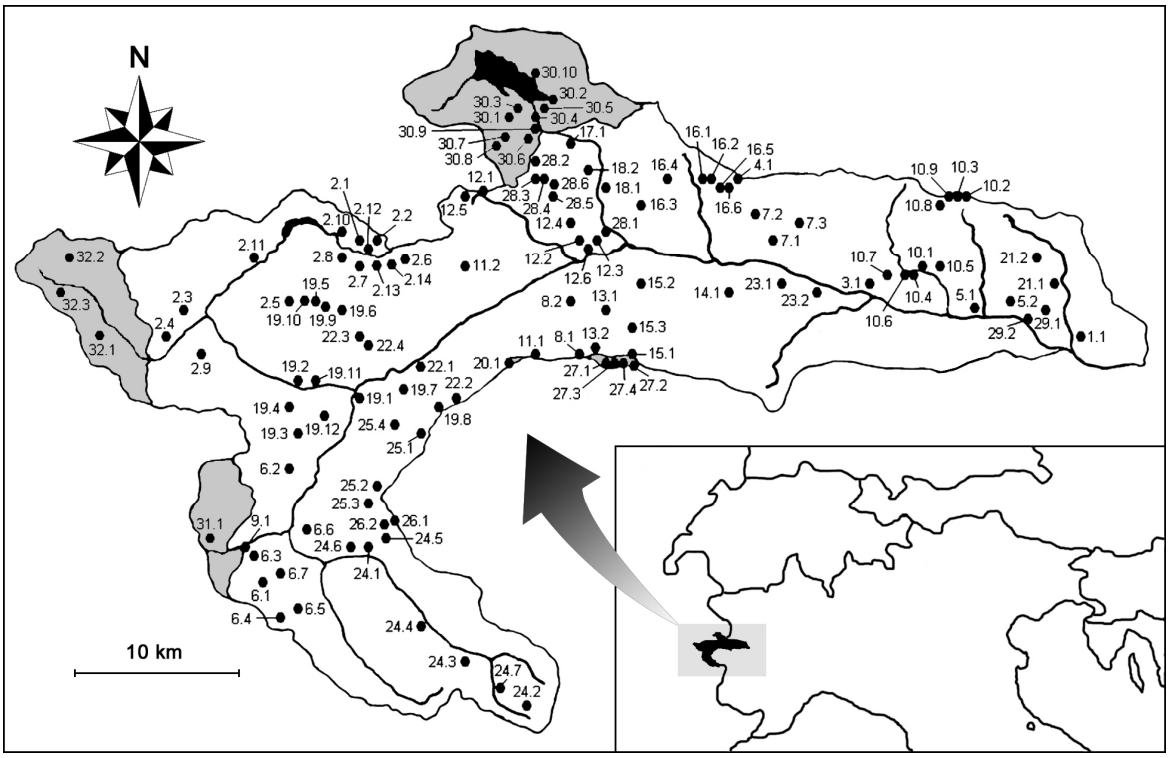

Figure 1. Collection sites. Localities are numbered according to table 1; shaded areas are part of the French territory.

Table 1. Collection sites, subdivided by municipal district (Italy) and mountain territory (France), with their altitude, UMT WGS 84 co-ordinates (East-North) 32N time zone, and the indication of the year(s) they were visited (number of visits in brackets).

	Locality	Site	m a.s.l.	UTM WGS 84	year (visits)
	ITALY				
1.1	Avigliana	Drubiaglio	340	375810 4994860	1984 (8) 1985 (11)
2.1	Bardonecchia	Lago Patarè	2810	329800 4999300	2003 (1)
2.2		Lago Sommeiller	2980	330230 4999870	2003 (1)
2.3		Les Arnauds	1360	317970 4993050	2004 (2)
2.4		Melezet	1380	317630 4992400	1977 (1)
2.5		Monte Jafferau	2660-2800	324340 4994440	2004 (1)
2.6		Passo dei Fourneaux settentrionale	3130	331250 4998540	2006 (1)
2.7		Pian dei Frati	2580	328800 4998850	2003 (1)
2.8		Pian dei Morti	2380	327330 4999320	2003 (1)
2.9		Punta Colomion	2020	319750 4991300	2004 (1)
2.10		Rifugio Scarfiotti	2150	327120 5000050	2003 (1)
2.11		Rochemolles	1640-1760	323250 4998430	2004 (1)
2.12		Strada per il Sommeiller	2710	329320 4999070	2003 (1)
2.13		Vallon du Fond*	2730-2820	329770 4998280	2006 (1)
2.14		Vallon du Fond**	2970-3070	330850 4998460	2006 (1)
3.1	Borgone	Borgone	400	361130 4998300	2001 (3)
4.1	Bussoleno	Colle della Croce di Ferro	2500-2550	353390 5005410	2003 (1)
5.1	Caprie	Caprie	380	368610 4997350	1985 (5)
5.2		Novaretto	360	370230 4996910	2002 (1)
6.1	Cesana Torinese	Colle Bercia	2190	325070 4977050	2004 (1)
6.2		Fenils	1390	325780 4983450	2004 (1)
6.3		Grangia la Coche Alta	1930	324140 4978500	2004 (1)
6.4		Lago Fontana Fredda	2170	325150 4974140	2004 (1)
6.5		Lago Nero	2020	325940 4974480	2004 (1)
6.6		Monte Cruzeau	1570	326680 4978840	2004 (1)
6.7		Sagna Longa	2010-2080	325340 4977680	2004 (1)
7.1	Chianocco	Chianocco	540	355980 5000980	2002 (1)
7.2		Grangia Pianfè	1240	355580 5003530	2002 (1)
7.3		Pavaglione	1010-1050	357370 5002310	2001 (1) 2002 (1)
8.1	Chiomonte	Cima Ciantiplagna	2650-2750	343140 4992850	2003 (1)
8.2		Frais	1460	342280 4996480	2004 (1)
9.1	Claviere	Claviere	1750	322690 4978610	2004 (1)
10.1	Condove	Bertolere	940	365030 4999750	2002 (1)
10.2		Colle del Colombardo	1890	367310 5005180	2005 (1)
10.3		Colombardino	1890	366620 5005490	2005 (1)
10.4		Frassinere	980	364460 4999090	2003 (1)
10.5		Mocchie	820	365530 4999570	1985 (2) 2002 (1)
10.6		Mollette	1240	362560 5000040	2002 (2)
10.7		Prarotto	1430	361440 5000980	2002 (3) 2003 (1)
10.8		Punta Sbaron	2090	365050 5003950	2005 (1)
10.9		Tomba di Matolda	2010	365550 5004950	2005 (1)
11.1	Exilles	Colle dell'Assietta	2450	339170 4992800	2004 (1)
11.2		Rifugio Levi-Molinari	1870	334440 4997900	2004 (1)
12.1	Giaglione	Colle Clapier	2480	336670 5003720	2005 (1)
12.2		Cresto	1070	342340 5000510	2003 (1)
12.3		Forte	690	344950 5000550	2002 (1)
12.4		Pra Piano	1500	341620 5001370	2003 (1)
12.5		Rio Clapier	2430	336280 5003420	2005 (1)
12.6		Sant'Andrea	810	343800 5000860	2001 (1)
13.1	Gravere	Pian Gelassa	1525-1540	345000 4995990	2002 (1) 2003 (1)

(Continued)

(Table 1 Continued)

	Locality	Site	m a.s.l.	UTM WGS 84	year (visits)
13.2		Punta del Mezzodì	2600-2650	344080 4993650	2003 (1)
14.1	Mattie	Giordani	690	352250 4997930	2001 (1)
15.1	Meana di Susa	Colle delle Finestre	2150-2250	346620 4992920	2002 (1) 2003 (2)
15.2		Corbolej	670	348460 4998130	2001 (1) 2002 (3)
15.3		Piano del Tiraculo	1930	346950 4993710	2002 (1)
16.1	Mompantero	Alpe Arcella*	2030-2070	350830 5004700	2003 (1)
16.2		Alpe Arcella**	2110	351060 5004700	2003 (1)
16.3		Il Trucco	1710-1740	347730 5003160	2002 (1) 2003 (1)
16.4		La Riposa	2180	349290 5004530	2002 (2)
16.5		Monte Palon*	2200-2400	352110 5004320	2003 (1)
16.6		Monte Palon**	2460	352340 5004510	2003 (1)
17.1	Moncenisio	Ferrera Cenisio	1450	341510 5007640	1976 (1) 2001 (1)
18.1	Novalesa	Novalesa	910	343480 5006800	2001 (3) 2002 (2)
18.2		San Rocco	740	344120 5004620	2002 (1)
19.1	Oulx	Oulx	1060	330040 4989640	1993 (9)
19.2		C. Blanc	1130	324630 4990390	2004 (1)
19.3		C. Pourachet	2070	325450 4986220	2004 (1)
19.4		Chateau Beaulard	1410	324550 4988840	2004 (1)
19.5		Col Basset	2440-2510	327090 4993960	2004 (1)
19.6		Grotta dei Saraceni	2260	328370 4993840	2004 (1)
19.7		Monfol	1650	332610 4990190	1993 (1)
19.8		Monte Genevris	2480	334820 4988670	2004 (1)
19.9		Monte Vin Vert	2390	327910 4993550	2004 (1)
19.10		Rochers de l'Aigle	2620-2650	326390 4994400	2004 (1)
19.11		Savoulx	1130	325510 4990080	2004 (1)
19.12		Vazon	1680	327810 4987470	2004 (1)
20.1	Pragelato	Lago dell'Assietta	2520	337930 4991830	2004 (1)
21.1	Rubiana	Rubiana	680	373110 5000190	1973 (1)
21.2		Favella	990	371620 5001750	1973 (1)
22.1	Salbertrand	Salbertrand	1040	334430 4993050	1993 (2)
22.2		Colle Blegier	2360	335830 4989190	2004 (1)
22.3		Colletto Pramand	2090	329900 4992780	2004 (1)
22.4		Forte Pramand	2140	330010 4992410	2004 (1)
23.1	San Giorio di Susa	San Giorio di Susa	440	357110 4998660	2001 (2)
23.2		Malpasso	410	358960 4997930	1984 (1) 1985 (7)
24.1	Sauze di Cesana	Sauze di Cesana	1550	330660 4978570	2004 (1)
24.2		Alpe Gran Mioul	2420	339720 4969510	2004 (1)
24.3		Argentera	1900	336950 4972680	2004 (1)
24.4		Brusà del Plan	1820	333950 4975400	2004 (1)
24.5		Grange Sises	1860	332050 4978960	2004 (1)
24.6		Rollières	1490	329310 4978240	2004 (1)
24.7		Valle del Gran Mioul	2110-2250	339160 4970520	2004 (1)
25.1	Sauze d'Oulx	Colle di Costa Piana	2310	334540 4987440	2004 (1)
25.2		Lago Nero	2290	332100 4985220	2004 (1)
25.3		Notre Dame des Broussailles	2280-2320	331310 4985020	2004 (2)
25.4		Richardette	1710	332580 4988340	2004 (1)
26.1	Sestriere	Campo sportivo	2070	332620 4980860	2004 (1)
26.2		Plagnols	1970	332250 4979950	2004 (1)
27.1	Usseaux	Colle della Vecchia	2420-2490	344630 4992980	2003 (1)
27.2		Colle delle Finestre	2000	346550 4991960	2003 (1)
27.3		Madonna del Dente	2460-2550	344570 4993190	2003 (1)
27.4		Monte Pintas	2330-2400	345530 4993130	2003 (2)

(Continued)

(Table 1 Continued)

	Locality	Site	m a.s.l.	UTM WGS 84	year (visits)
28.1	Venaus	Venaus	560	344850 5001190	2002 (2)
28.2		Fondo di Bar	1590	340460 5006320	2002 (2) 2003 (1)
28.3		Grangia della Vecchia	2200-2250	339970 5004370	2004 (1)
28.4		Grangia Marzo	1990-2080	341160 5004090	2004 (1)
28.5		Rio Tillirei	2000	340930 5003440	2004 (1)
28.6		Torrente Clanero	2120-2150	340410 5004360	2004 (1)
29.1	Villar Dora	Villar Dora	350	372510 4996830	1977 (2)
29.2		Torre del Colle	350	372160 4995670	2001 (1)
	FRANCE				
30.1	Mont Cenis	Cumba di Crevacuore	2150	338000 5009110	2003 (1)
30.2		Barrage	2030	340150 5010220	2002 (1)
30.3		Fort Variselle	2040-2100	338410 5009590	2003 (1)
30.4		Gran Scala	1760	339590 5008880	2002 (2)
30.5		Grand-Croix	1850	339510 5009370	2002 (1)
30.6		Lac de Rotherel	1950	339690 5007460	2003 (1)
30.7		Mont Malamot*	2180-2400	337580 5008880	2003 (1)
30.8		Mont Malamot**	2500-2650	336620 5007900	2003 (1)
30.9		Piano San Nicolao	1720-1770	339590 5008550	2001 (3) 2002 (3) 2003 (1)
30.10		Plan des Fontainettes	2090	338830 5012100	2001 (1) 2002 (1)
31.1	Montgenèvre	Col de Mongenèvre	1870	320760 4978130	2004 (1)
32.1	Valleé Etroite	Grange di Valle Stretta	1760	312980 4993480	2004 (1)
32.2		La Grosse Somme	2150-2400	311810 4998170	2004 (1)
32.3		Vallon de Tavernette	1820-2100	311870 4995650	2004 (1)

Results

Altogether, 1,102 specimens (180 queens, 227 males, and 695 workers) were collected in 124 sites between 340 and 3,130 m a.s.l. (mean value 1.950 m). They belong to 30 species, eight of which can be considered predominant, each one representing over 5% of the specimens collected, 12 are common (1-5% of the specimens) and the remaining nine are rare (less than 1%) (table 2). In the period 1973-1993, 15 species had already been identified, while the remaining 15 were added in the years 2001-2004 (figure 2) and no more species were found in the last two years; the rarefaction curve of the cumulative number of species identified vs the number of specimens (figure 3) tends to get asymptotic after the first 200 specimens, thus marking that the probability to find further species in the Susa Valley is poor.

To illustrate more clearly the altitudinal distribution of the different species, the collection sites were grouped by altitude (table 2), following the indications by Comba and Comba (2001). Neglecting the rare species, for which an evaluation is difficult to express, it is noted that: *Bombus hortorum* (L.), *Bombus rupestris* (F.), *Bombus vestalis* (Geoffroy), *Bombus pratorum* (L.), *Bombus lucorum* (L.), *Bombus terrestris* (L.), and *Bombus lapidarius* (L.) are characterized by a more or less

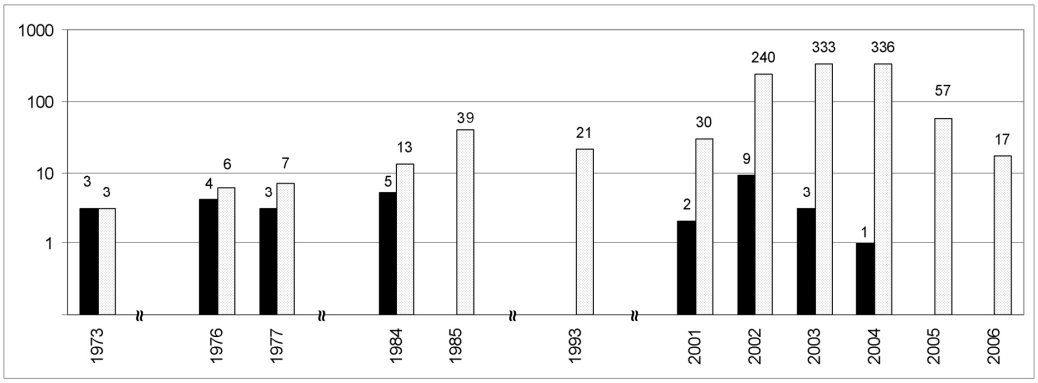

Figure 2. Number of *Bombus* specimens collected in the Susa Valley from 1973 to 2006 (dotted) and number of species identified for the first time in each year (black).

Table 2. Number of *Bombus* specimens collected in the Susa Valley and number of queen (♀), male (♂), and workers (☿) sampled at different altitudes.

	Specimens		≤700			701-1000			1001-1400			1401-1800			1801-2100			2101-2400			>2400		
	No.	%	♀	♂	☿	♀	♂	☿	♀	♂	☿	♀	♂	☿	♀	♂	☿	♀	♂	☿	♀	♂	☿
B. mendax	35	3.18																6	2		3	11	13
B. soroeensis	83	7.53							1		1	1	11	10	1	2	22		3	23			8
B. subterraneus	5	0.45			2				1						1				1				
B. argillaceus	1	0.09	1																				
B. hortorum	21	1.91	1		4			3	1		1	2	1	4			2		1				1
B. ruderatus	1	0.09						2															
B. humilis	25	2.27	1	2	8	2			5	2	1	1		3									
B. mesomelas	75	6.81			1						1	3	1	3	12	3	18	3	3	14	6	1	6
B. mucidus	13	1.18										1			3			2		1	4		2
B. pascuorum	36	3.27	6		11	4	2	2	1		1			9									
B. ruderarius	73	6.62									3	10	5	14	11		14	4	3	8			1
B. sylvarum	18	1.63			4						14												
B. bohemicus	18	1.63								1			7			3		1	4		1	1	
B. flavidus	3	0.27																				3	
B. maxillosus	1	0.09	1																				
B. quadricolor	1	0.09										1											
B. rupestris	18	1.63	4							1		5	1		1	1		2	1			2	
B. sylvestris	7	0.64	1									2	1		1				1			1	
B. vestalis	14	1.27	1			1				1			1			8		1				1	
B. hypnorum	4	0.36											2				1			1			
B. monticola	101	9.17											1	13		1	8		8	25	9	10	26
B. pratorum	56	5.08			2			5			2	2	1	11		1	16			11			5
B. pyrenaeus	46	4.17											2	1		1	8	3	1	18	1	6	5
B. alpinus	28	2.54															1			4	1	7	15
B. cryptaum	8	0.73											1			1	1			3			2
B. lucorum	170	15.42	2	1	2	1				3	2	4	9	17	1	8	19		9	33	2	14	43
B. terrestris	95	8.62	3	2	17		1	11	1		6	2	3	4		3	4		7	17		6	8
B. wurflenii	35	3.18											1	5	1	7	12		1	4			4
B. lapidarius	77	6.99	3		2	3		3	3		2	12	7	3	1		8	2		12			16
B. sichelii	34	3.09											2	2		2	7	2	2	11		3	3

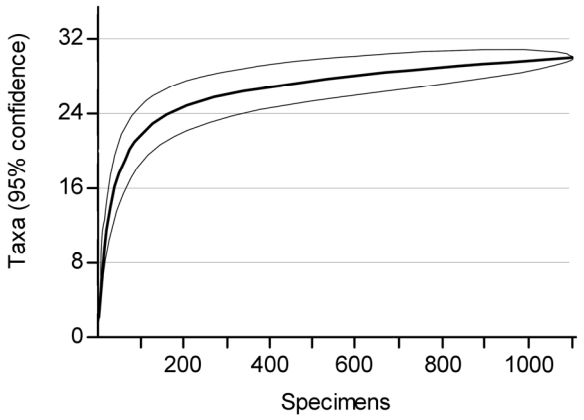

Figure 3. Rarefaction curve, with 95% confidence intervals, of the cumulative mumber of *Bombus* species identified in the Susa Valley. Computations and drawing performed using PAST: Paleontological Statistics Software Package for Education and Data Analysis (Hammer *et al*., 2001).

uniform presence throughout the area; *Bombus soroeensis* (F.) and *Bombus ruderarius* (Muller) are absent below 1,000 m a.s.l. and were preferably found at intermediate or medium-high elevations; *Bombus monticola* Smith, *Bombus pyrenaeus* Perez, *Bombus wurflenii* Radoszkowski, and *Bombus sichelii* Radoszkowski do not occupy low elevations, but start to appear only above 1,400 m a.s.l., reaching the highest places; the same can be said, with some exceptions, also for *Bombus mesomelas* Gerstaecker and *Bombus bohemicus* Seidl; *Bombus humilis* Illiger, *Bombus pascuorum* (Scopoli), and *Bombus sylvarum* (L.) do not exceed 1,400 m a.s.l. (the first two) and 1,800 m a.s.l. (the third one); *Bombus mendax* Gerstaecker and *Bombus alpinus* (L.), instead, are found, with only one exception, always above 2,100 m a.s.l.

Altogether 83.5% of the samples have data on the plant on which they were collected; a total of 52 plant genera within 20 plant families were visited (figure 4). Among all the plants, the Fabaceae prevail (36.5% of the visits) with nine genera and some species visited with a high frequency: *Onobrychis viciifolia* Scop., *Trifolium pratense* L., *Trifolium alpinum* L., and *Lotus alpinus* (DC.) Schleicher. The Asteraceae represented 15.5% of the visits (82.5% were species of the genus *Cirsium*) and the Onagraceae represented 13.0% of the visits (only *Epilobium angustifolium* L.). Less visited, but by no means the least, are the Lamiaceae with 9.9% of the visits (35.1% were *Salvia pratensis* L. and 42.9% were some species of the genus *Thymus*) and the Ericaceae with 5.2% of the visits thanks, almost exclusively (93.8%), to *Rhododendron ferrugineum* L.. The eight predominant *Bombus* species, referring to 631 observations out of the total 920 ones, visited plants belonging to 47 genera of all the 20 plant families recorded (table 3). But if we consider the plant genera visited by each of the eight *Bombus* species, we see that the range goes from 13 plant genera visited by *B. mesomelas* to 28 plant genera visited by *B. terrestris* and that there is a positive correlation between the number of plant visits of each *Bombus* species and the number of plant genera visited (Pearson Product Moment Correlation Coefficient = 0.733; P = 0.0384). Nevertheless we point out some remarkable differences in botanic preferences of the different species; only three genera (*Epilobium*, *Onobrychis*, and *Trifolium*) were visited by all eight species and, however, with very different frequencies.

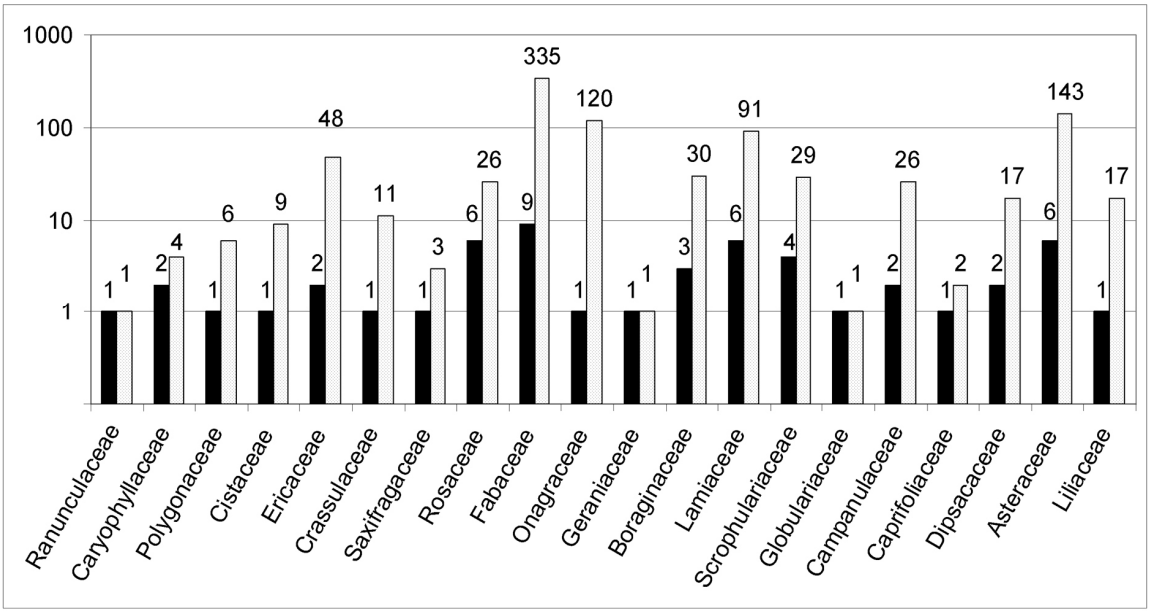

Figure 4. Number of plant genera (black) visited by bumble bees in the Susa Valley and number of *Bombus* specimens collected (dotted) from each plant family. Plant families are listed in a systematic order (Aeschimann *et al*., 2004).

Table 3. Plant genera visited by the eight predominant *Bombus* species in the Susa Valley. Plant families are listed in a systematc order (Aeschimann *et al*., 2004) and diversity computations were performed using PAST: Paleontological Statistics Software Package for Education and Data Analysis (Hammer *et al*., 2001).

Plant family	Plant genus	*B. soroeensis*	*B. mesomelas*	*B. ruderarius*	*B. monticola*	*B. pratorum*	*B. lucorum*	*B. terrestris*	*B. lapidarius*
Ranunculaceae	*Ranunculus*							1.2%	
Caryophyllaceae	*Silene*						0.7%		
Polygonaceae	*Polygonum*	1.3%					2.1%	2.4%	
Cistaceae	*Helianthemum*				1.2%		3.5%	1.2%	
Ericaceae	*Rhododendron*	6.4%	1.7%	9.7%		12.9%	3.5%	1.2%	
	Vaccinium					1.9%			
Crassulaceae	*Sedum*	1.3%		1.6%	2.4%		1.4%		
Saxifragaceae	*Saxifraga*						2.1%		
Rosaceae	*Dryas*				1.2%				
	Geum			9.7%		9.2%			
	Malus							1.2%	1.5%
	Potentilla					3.7%			
	Prunus						1.4%	2.4%	
	Rosa					1.9%			
Fabaceae	*Anthyllis*	1.3%	3.4%	3.2%			1.4%		2.9%
	Astragalus		3.4%	1.6%	3.7%		1.4%	2.4%	1.5%
	Lotus			1.6%	22.1%	3.7%	4.2%	1.2%	10.1%
	Medicago						1.4%	1.2%	
	Onobrychis	7.7%	12.1%	19.4%	20.8%	5.6%	2.1%	8.2%	11.5%
	Trifolium	5.1%	31.1%	19.4%	8.5%	5.6%	11.7%	34.3%	21.6%
	Vicia				1.2%		0.7%	1.2%	5.8%
Onagraceae	*Epilobium*	26.8%	17.3%	4.8%	4.9%	9.2%	20.7%	4.8%	4.4%
Geraniaceae	*Geranium*						0.7%		
Boraginaceae	*Cynoglossum*			1.6%		9.2%			
	Echium	2.6%	1.7%	1.6%	2.4%	3.7%	1.4%	4.8%	
	Eritrichium						0.7%		1.5%
Lamiaceae	*Ajuga*		1.7%		1.2%		0.7%	2.4%	1.5%
	Prunella			6.6%					
	Salvia	2.6%	5.2%			9.2%	4.2%	4.8%	5.8%
	Stachys			4.8%					
	Thymus				8.5%	3.7%	9.0%	2.4%	
Scrophulariaceae	*Pedicularis*				1.2%	1.9%	4.2%		
	Rhinanthus	1.3%		3.2%		3.7%	2.8%	2.4%	2.9%
	Veronica							1.2%	
Globulariaceae	*Globularia*							1.2%	
Campanulaceae	*Campanula*	9.0%		1.6%	2.4%		0.7%		
	Phyteuma	6.4%		1.6%		1.9%	0.7%	1.2%	2.9%
Caprifoliaceae	*Lonicera*	1.3%		1.6%					
Dipsacaceae	*Knautia*	2.6%		3.2%				2.4%	1.5%
	Scabiosa				1.2%		0.7%	1.2%	
Asteraceae	*Carlina*		1.7%						
	Centaurea	1.3%		1.6%	1.2%			1.2%	
	Cirsium	21.7%	17.3%		13.5%	1.9%	13.1%	5.9%	21.6%
	Echinops		1.7%						
	Helianthus		1.7%			1.9%		1.2%	
	Taraxacum			1.6%	2.4%				1.5%
Liliaceae	*Asphodelus*	1.3%				9.2%	2.8%	4.8%	1.5%
number of plant genera		17	13	20	18	19	28	27	17
number of *Bombus* specimens		78	58	62	82	54	144	84	69
Shannon index		2.28	2.03	2.56	2.36	2.74	2.77	2.63	2.35
lower bootstrap (95% confidence)		*1.93*	*1.62*	*2.11*	*2.01*	*2.37*	*2.48*	*2.15*	*1.99*
upper bootstrap (95% confidence)		*2.38*	*2.15*	*2.62*	*2.44*	*2.73*	*2.83*	*2.70*	*2.44*

List of collected specimens

Genus *Bombus* Latreille 1802

Subgenus *MENDACIBOMBUS* Skorikov 1914

Bombus mendax ssp. *mendax* Gerstaecker 1869
BARDONECCHIA: Lago Pataré, 1.VIII.2003 1♀ 6♂♂ 4☿☿; Pian dei Frati, 1.VIII.2003 1♀ 4♂♂ 3☿☿; Pian dei Morti, 1.VIII.2003 1♂; Strada per il Sommelier, 1.VIII.2003 1☿; Vallon du Fond*, 11.VII.2006 1♀ 1☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 4☿. MOMPANTERO: Monte Palona, 18.VII.2003 1♂. SALBERTRAND: Colle Blegier, 13.VII.2004 2♀♀. SAUZE DI CESANA: Valle del Gran Mioul, 15.VII.2004 1♀. USSEAUX: Madonna del Dente, 25.VII.2003 1♂. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 3♀♀.

Subgenus *KALLOBOMBUS* Dalla Torre 1880

Bombus soroeensis ssp. *proteus* (Gerstaecker 1869)
BARDONECCHIA: Lago Patarè, 1.VIII.2003 1☿; Lago Sommeiller, 1.VIII.2003 1☿; Les Arnauds, 9.VII.2004 1☿; Rochemolles, 2.IX.2004 6♂♂ 1☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 3☿☿. CESANA TORINESE: Colle Bercia, 15.VII.2004 1☿; Fenils, 17.VI.2004 1♀; Sagna Longa, 15.VII.2004 2☿☿. CHIOMONTE: Frais, 27.VII.2004 1☿. CLAVIERE: 2.IX.2004 2♂♂ 3☿☿. CONDOVE: Colle del Colombardo, 30.VI.2005 4☿☿; Colombardino, 30.VI.2005 1♀ 1☿; Prarotto, 3.VII.2002 1☿. MEANA DI SUSA: Piano del Tiraculo, 17.VII.2002 1☿. MOMPANTERO: La Riposa, 22.VIII.2002 2♂♂; Monte Palon*, 18.VII.2003, 1☿. MONT CENIS (France): Fort Variselle, 8.VII.2003 1☿; Gran Scala, 3.VII.2002 1☿, 22.VIII.2002 2☿☿; Piano San Nicolao, 31.V.2002 1♀. MONTGENÈVRE (France): Col de Montgenèvre, 2.IX.2004 1☿. OULX: C. Pourachet, 29.VI.2004 3☿☿; Col Basset, 23.VII.2004 1☿; Grotta dei Saraceni, 23.VII.2004 8☿☿; Roches de l'Aigle, 23.VII.2004 1☿. PRAGELATO: Lago dell'Assietta, 13.VII.2004 1☿. SALBERTRAND: Colle Blegier, 13.VII.2004 1☿; Forte Pramand, 25.VI.2004 1☿. SAUZE DI CESANA: 2.IX.2004 3♂♂ 1☿. SAUZE D'OULX: Lago Nero, 13.VII.2004 3☿☿; Notre Dame des Broussailles, 29.VI.2004 2☿☿, 13.VII.2004 2☿☿. SESTRIERE: Plagnols, 2.IX.2004 4☿☿. USSEAUX: Monte Pintas, 25.VII.2003 2☿☿. VENAUS: Grangia della Vecchia, 27.VII.2004 1♂ 1☿; Grangia Marzo, 27.VII.2004 1♂; Rio Tillirei, 27.VII.2004 1♂ 5☿☿; Torrente Clanero, 27.VII.2004 1☿.

Subgenus *SUBTERRANEOBOMBUS* Vogt 1911

Bombus subterraneus ssp. *latreillellus* (Kirby 1802)
AVIGLIANA: Drubiaglio, 12.VIII.1984 1☿, 17.VIII.1984 1☿. MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 1♂. MONT CENIS (France): Grand-Croix, 18.VI.2002 1♀. OULX: C.Blanc, 17.VI.2004 1♀.

Subgenus *MEGABOMBUS* Dalla Torre 1880

Bombus argillaceus (Scopoli 1763)
VILLAR DORA: 20.IV.1977 1♀.

Bombus hortorum ssp. *hortorum* (L. 1761)
AVIGLIANA: Drubiaglio, 24.VII.1984 1☿, 27.VII.1984 1☿, 31.VIII.1985 1☿. BORGONE: 30.III.2001 1♀. CONDOVE: Frassinere, 20.V.2003 1☿; Mocchie, 9.VIII.1985 1☿; Mollette, 31.V.2002 1♀ 1☿. GIAGLIONE: Sant'Andrea, 20.V.2003 1☿. GRAVERE: Pian Gelassa, 18.VI.2002 1♀, 19.VI.2003 4☿☿. MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 1♂. MONCENISIO: Ferrera Cenisio, 7.VIII.1976 1♂. MONT CENIS (France): Gran Scala, 3.VII.2002 1♀. OULX: Col Basset, 23.VII.2004 1☿. VENAUS: Rio Tillirei, 27.VII.2004 2☿☿. VILLAR DORA: 20.IV.1977 1☿.

Bombus ruderatus ssp. *autumnalis* (F. 1793)
AVIGLIANA: Drubiaglio, 11.VIII.1984 1☿.

Subgenus *THORACOBOMBUS* Dalla Torre 1880

Bombus humilis ssp. *quasimuscorum* Vogt 1909
CESANA TORINESE: Monte Cruzeau, 29.VI.2004 1☿. MEANA DI SUSA: Corbolej, 14.V.2002 1♀. NOVALESA: 31.V.2002 1♀. OULX: 3.VI.1993 1♀; Chateau Beaulard, 29.VI.2004 1☿. SALBERTRAND: 3.VI.1993 1♀. SAN GIORIO DI SUSA: Malpasso, 31.VII.1985 1☿. SAUZE DI CESANA: 2.IX.2004 1☿. VENAUS: Fondo di Bar, 18.VI.2002 1♀.

Bombus humilis ssp. *tristis* Seidl 1837
AVIGLIANA: Drubiaglio, 27.VII.1984 1☿, 12.VIII.1984 1☿. BARDONECCHIA: Les Arnauds, 9.VII.2004 1♂. CAPRIE: 31.VII.1985 1☿, 9.VIII.1985 2☿☿, 28.VIII.1985 1♂, 30.VIII.1985 1♂. CHIANOCCO: Grangia Pianfè, 31.V.2002 1♀; Pavaglione, 20.IX.2001 1♀. CONDOVE: Bertolere, 31.V.2002 1♀. GIAGLIONE: Cresto, 20.V.2003 1♀. OULX: 20.VIII.1993 1♂. SALBERTRAND: 15.VII.1993 1☿. SAN GIORIO DI SUSA: Malpasso, 9.VII.1985 1☿, 9.VIII.1985 1☿.

Bombus mesomelas ssp. *mesomelas* Gerstaecker 1869
BARDONECCHIA: Lago Patarè, 1.VIII.2003 2♀♀ 1☿; Pian dei Frati, 1.VIII.2003 1♂ 1☿; Pian dei Morti, 1.VIII.2003 1☿; Punta Colomion, 17.VI.2004 1☿. CESANA TORINESE: Grangia la Coche Alta, 17.VI.2004 1☿; Lago Nero, 17.VI.2004 1♀. CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 1☿. CONDOVE: Colombardino, 30.VI.2005 1☿. MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 2☿☿, 25.VII.2003 2☿☿. MOMPANTERO: Alpe Arcella*, 18.VII.2003 3☿☿; Alpe Arcella**, 18.VII.2003 1☿; La Riposa, 17.VII.2002 2☿☿, 22.VIII.2002 2♂♂; Monte Palon*, 18.VII.2003 2☿☿. MONCENISIO: Ferrera Cenisio, 15.VI.2001 1♀. MONT CENIS (France): Fort Variselle, 8.VII.2003 2☿☿; Gran Scala, 3.VII.2002 1♀, 22.VIII.2002 1♂; Grand-Croix, 18.VI.2002 3♀♀; Plan des Fontainettes, 22.VIII.2002 3♂♂ 7☿☿. OULX: 20.VIII.1993 1☿; C. Pourachet, 29.VI.2004 2♀♀; Monte Genevris, 13.VII.2004 1♀; Monte Vin Vert, 23.VII.2004 1♂. PRAGELATO: Lago dell'Assietta, 13.VII.2004 2♀♀. RUBIANA: 13.IX.1973 1☿. SALBERTRAND: Colletto Pramand, 23.VII.2004 1☿. SAUZE DI CESANA: 2.IX.2004 3☿☿; Alpe Gran Mioul, 15.VII.2004 1♀; Brusà del Pian, 25.VI.2004 1♀. SAUZE D'OULX: Notre Dame des Broussailles, 29.VI.2004 2♀♀. SESTRIERE: Campo sportivo, 29.VI.2004 5♀♀. USSEAUX: Madonna del Dente, 25.VII.2003 3☿☿; Monte Pintas, 25.VI.2003 2☿☿; 25.VII.2003 2☿☿. VALLÉE ETROITE (France): La Grosse

Somme, 9.VII.2004 1♀; Vallon de Tavernette, 9.VII.2004 2☿☿. VENAUS: Fondo di Bar, 31.V.2002 1♀.

Bombus mucidus ssp. *mollis* (Perez 1879)
BARDONECCHIA: Pian dei Morti, 1.VIII.2003 1☿; Punta Colomion, 17.VI.2004 1♀; Strada per il Sommeiller, 1.VIII.2003 1☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 1♀. CESANA TORINESE: Lago Nero, 17.VI.2004 2♀♀. CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 1☿. MONT CENIS (France): Piano San Nicolao, 18.VI.2002 1♀. SAUZE DI CESANA: Alpe Gran Mioul, 15.VII.2004 1♀; Valle del Gran Mioul, 15.VII.2004 2♀♀. USSEAUX: Madonna del Dente, 25.VII.2003 2♀♀.

Bombus pascuorum ssp. *melleofacies* Vogt 1909
AVIGLIANA: Drubiaglio, 11.VIII.1984 1☿, 12.VIII.1984 1☿, 24.VII.1985 1☿, 30.VIII.1985 2☿☿. BORGONE: 26.III.2001 1♀, 30.III.2001 2♀♀, 13.IV.2001 1♀.CAPRIE: 31.VII.1985 1☿; Novaretto, 19.IV.2002 1♀. CONDOVE: Bertolere, 31.V.2002 1♀; Mocchie, 9.VIII.1985 1♀ 2☿☿, 23.VIII.1985 1♀ 1♂; Mollette, 3.VII.2002 1☿. GIAGLIONE: Cresto, 20.V.2003 1♀; Sant'Andrea, 20.V.2003 1♀ 1♂. GRAVERE: Pian Gelassa, 19.VI.2003 3☿☿. MEANA DI SUSA: Corbolej, 13.IV.2001 1♀. MONCENISIO: Ferrera Cenisio, 7.VIII.1976 3☿☿. OULX: Chateau Beaulard, 29.VI.2004 1☿. SAN GIORIO DI SUSA: Malpasso, 24.VII.1985 1☿, 31.VII.1985 1☿, 23.VIII.1985 1☿, 29.VIII.1985 2☿☿. SAUZE DI CESANA: 2.IX.2004 2☿☿.

Bombus ruderarius ssp. *ruderarius* (Mueller 1776)
BARDONECCHIA: Les Arnauds, 17.VI.2004 1☿; Melezet, 31.VII.1977 1☿; Punta Colomion, 17.VI.2004 1☿. CESANA TORINESE: Grangia la Coche Alta, 17.VI.2004 2♀♀; Lago Nero, 17.VI.2004 1♀ 1☿; Sagna Longa, 15.VI.2004 3☿☿. CHIANOCCO: Grangia Pianfé, 31.V.2002 1☿. CONDOVE: Colle del Colombardo, 30.VI.2005 1☿; Colombardino, 30.VI.2005 2☿☿. EXILLES: Rifugio Levi-Molinari, 25.VI.2004 1☿. GRAVERE: Pian Gelassa, 18.VI.2002 4♀♀ 2☿☿, 19.VI.2003 2☿☿. MEANA DI SUSA: Piano del Tiraculo, 17.VII.2002 1☿. MOMPANTERO: Alpe Arcella**, 18.VII.2003 1☿; Il Trucco, 17.VII.2002 3♂♂ 2☿☿, 20.V.2003 2♀♀; La Riposa, 17.VII.2002 6☿☿, 22.VIII.2002 3♂♂. MONCENISIO: Ferrera Cenisio, 7.VIII.1976 1☿, 15.VI.2001 1☿. MONT CENIS (France): Gran Scala, 3.VII.2002 1☿, 22.VIII.2002 1☿; Grand-Croix, 18.VI.2002 1☿; Piano San Nicolao, 13.VII.2001 1☿, 22.VIII.2002 1♂, 19.VI.2003 2☿☿. OULX: C. Pourachet, 29.VI.2004 4♀♀; Col Basset, 23.VII.2004 1☿; Vazon, 29.VI.2004 1☿. SALBERTRAND: Colle Blegier, 13.VII.2004 1♀. SAUZE DI CESANA: Brusà del Plan, 25.VI.2004 1♀ 1☿; Rollières, 15.VII.2004 1♂; Valle del Gran Mioul, 15.VII.2004 1☿. SAUZE D'OULX: Colle di Costa Piana, 13.VII.2004 1♀; Notre Dames des Broussailles, 13.VII.2004 1♀. SESTRIERE: Campo Sportivo, 29.VI.2004 2♀♀. VALLÉE ETROITE (France): Grange di Valle Stretta, 17.VI.2004 2♀♀; La Grosse Somme, 9.VII.2004 1♀; Vallon de Tavernette, 9.VII.2004 1♀ 2☿☿. VENAUS: Fondo di Bar, 31.V.2002 2♀♀.

Bombus sylvarum ssp. *sylvarum* (L. 1761)
AVIGLIANA: Drubiaglio, 2.VIII.1984 1☿, 24.VII.1985 1☿, 23.VIII.1985 1☿. CAPRIE: 9.VIII.1985 1☿. OULX: 15.VII.1993 1☿, 30.VII.1993 1☿, 10.VIII.1993 2☿☿, 20.VIII.1993 5☿☿, 28.VIII.1993 1☿, 6.IX.1993 3☿☿, 21.IX.1993 1☿.

Subgenus *PSITHYRUS* Lepeletier 1832

Bombus bohemicus ssp. *bohemicus* Seidl 1837
BARDONECCHIA: Monte Jafferau, 23.VII.2004 1♀. CHIOMONTE: Frais, 27.VII.2004 7♂♂. CONDOVE: Mollette, 3.VII.2002 1♂. MEANA DI SUSA: Colle delle Finestre, 25.VII.2003 1♀ 1♂. OULX: Grotta dei Saraceni, 23.VII.2004 3♂♂; Rochers de l'Aigle, 23.VII.2004 1♂. SALBERTRAND: Colletto Pramand, 23.VII.2004 3♂♂.

Bombus flavidus ssp. *alpium* (Richards 1928)
CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 2♂♂. MONT CENIS (France): Mont Malamot**, 8.VII.2003 1♂.

Bombus maxillosus ssp. *maxillosus* Klug 1817
VILLAR DORA: 20.IV.1977 1♀.

Bombus quadricolor ssp. *meridionalis* (Richards 1928)
MOMPANTERO: Il Trucco, 17.VII.2002 1♀.

Bombus rupestris ssp. *rupestris* (F. 1793)
BARDONECCHIA: Pian dei Frati, 1.VIII.2003 1♂. CHIOMONTE: Frais, 27.VII.2004 1♂. CONDOVE: Mollette, 3.VII.2002 1♂. GIAGLIONE: Colle Clapier, 14.VII.2005 1♂. MEANA DI SUSA: Colle delle Finestre, 25.VII.2003 1♂. MONT CENIS (France): Gran Scala, 3.VII.2002 1♀; Piano San Nicolao, 29.VI.2001 2♀♀. OULX: Vazon, 29.VI.2004 1♀. SAN GIORIO DI SUSA: 15.V.2001 1♀, 25.V.2001 2♀♀. SAUZE DI CESANA: Valle del Gran Mioul, 15.VII.2004 1♀. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 1♀; Vallon de Tavernette, 9.VII.2004 1♀. VENAUS: 14.V.2002 1♀; Fondo di Bar, 18.VI.2002 1♀; Rio Tillirei, 27.VII.2004 1♂.

Bombus sylvestris (Lepeletier 1832)
CONDOVE: Prarotto, 31.V.2002 1♂. EXILLES: Rifugio Levi-Molinari, 25.VI.2004 1♀. GIAGLIONE: Pra Piano, 20.V.2003 1♀. GRAVERE: Pian Gelassa, 18.VI.2002 1♀. MEANA DI SUSA: Corbolej, 19.IV.2002 1♀. MONT CENIS (France): Mont Malamot**, 8.VII.2003 1♂. USSEAUX: Monte Pintas, 25.VII.2003 1♂.

Bombus vestalis ssp. *obenbergeri* (May 1944)
CHIANOCCO: 19.IV.2002 1♀. CONDOVE: Mocchie, 31.V.2002 1♀; Mollette, 3.VII.2002 1♂; Prarotto, 3.VII.2002 1♂. OULX: Col Basset, 23.VII.2004 1♂. SALBERTRAND: Colletto Pramand, 23.VII.2004 2♂♂; Forte Pramand, 25.VI.2004 1♀. VENAUS: Grangia Marzo, 27.VII.2004 1♂; Rio Tillirei, 27.VII.2004 5♂♂.

Subgenus *PYROBOMBUS* Dalla Torre 1880

Bombus hypnorum ssp. *ericetorum* (Panzer 1801)
CHIOMONTE: Frais, 27.VII.2004 2♂♂. OULX: C. Pourachet, 29.VI.2004 1☿.

Bombus hypnorum ssp. *hypnorum* (L. 1758)
MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 1☿.

Bombus monticola ssp. *hypsophilus* (Skorikov 1912)
BARDONECCHIA: Lago Patarè, 1.VIII.2003 1♂ 1☿; Monte Jafferau, 23.VII.2004 2☿☿; Pian dei Morti, 1.VIII.2003 1♂; Rifugio Scarfiotti, 1.VIII.2003 2♂♂; Strada per il Sommeiller, 1.VIII.2003 2♀♀ 1☿; Vallon du Fond*, 11.VII.2006 1☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 1♂ 2☿☿. CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 1♀ 2☿☿. CONDOVE: Tomba di Matolda, 30.VI.2005 1☿. GIAGLIONE: Rio Clapier, 14.VII.2005 11☿☿. GRAVERE: Punta del Mezzodì, 25.VII.2003 3♂♂ 1☿. MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 9☿☿, 25.VII.2003 1♂ 6☿☿; Piano del Tiraculo, 17.VII.2002 1☿. MOMPANTERO: La Riposa, 17.VII.2002 4☿☿, 22.VIII.2002 3♂♂; Monte Palon*, 18.VII.2003 1☿. MONCENISIO: Ferrera Cenisio, 15.VI.2001 1☿. MONT CENIS (France): Barrage, 3.VII.2002 1☿; Fort Variselle, 8.VII.2003 4☿☿; Gran Scala, 3.VII.2002 3☿☿, 22.VIII.2002 1♂; Lac de Rotherel, 19.VI.2003 1☿; Mont Malamot*, 8.VII.2003 2☿☿; Mont Malamot**, 8.VII.2003 2♂♂ 1☿; Piano San Nicolao, 18.VI.2002 1☿, 19.VI.2003 4☿☿, Plan des Fontainettes, 22.VIII.2002 1♂. USSEAUX: Colle della Vecchia, 25.VI.2003 1♂ 1☿; Madonna del Dente, 25.VI.2003 2☿☿, 25.VII.2003 6♀♀ 2♂♂ 1☿; Monte Pintas, 25.VI.2003 2☿☿; 25.VII.2003 1♂ 1☿. VENAUS: Fondo di Bar, 18.VI.2002 2☿☿, 20.V.2003 2☿☿.

Bombus pratorum ssp. *pratorum* (L. 1761)
BARDONECCHIA: Les Arnauds, 9.VII.2004 1☿; Monte Jafferau, 23.VII.2004 1☿. CESANA TORINESE: Sagna Longa, 15.VII.2004 1☿. CHIOMONTE: Frais, 27.VII.2004 1♂. CLAVIERE: 2.IX.2004 1☿. CONDOVE: Colle del Colombardo, 30.VI.2005 3☿☿; Colombardino, 30.VI.2005 1☿; Frassinere, 20.V.2003 3☿☿; Mocchie, 31.V.2002 1☿; Mollette, 31.V.2002 1☿; Prarotto, 20.V.2003 1☿; Punta Sbaron, 30.VI.2005 1☿; Tomba di Matolda, 30.VI.2005 1☿. EXILLES: Rifugio Levi-Molinari, 25.VI.2004 1☿. GIAGLIONE: Rio Clapier, 14.VII.2005 2☿☿. GRAVERE: Pian Gelassa, 18.VI.2002 2♀♀ 3☿☿. MEANA DI SUSA: Corbolej, 31.V.2002 1☿. MONT CENIS (France): Gran Scala, 3.VII.2002 2☿☿, 22.VIII.2002 1☿; Piano San Nicolao,19.VI.2003 1☿. OULX: C. Pourachet, 29.VI.2004 1♂ 6☿☿; Col Basset, 23.VII.2004 1☿; Vazon, 29.VI.2004 1☿. RUBIANA: Favella, 13.IX.1973 1☿. SALBERTRAND: Forte Pramand, 25.VI.2004 5☿☿. SAUZE DI CESANA: 2.IX.2004 1☿. SAUZE D'OULX: Notre Dame des Broussailles, 29.VI.2004 2☿☿, 13.VII.2004 1☿. USSEAUX: Madonna del Dente, 25.VII.2003 1☿. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 2☿☿; Vallon de Tavernette, 9.VII.2004 1☿. VENAUS: 31.V.2002 1☿; Grangia della Vecchia, 27.VII.2004 1☿; Grangia Marzo, 27.VII.2004 1☿.

Bombus pyrenaeus ssp. *tenuifasciatus* Vogt 1909
BARDONECCHIA: Lago Patarè, 1.VIII.2003 1☿; Lago Sommeiller, 1.VIII.2003 1♂; Passo dei Fourneaux settentrionale, 11.VII.2006 1♀; Pian dei Frati, 1.VIII.2003 2♂♂; Pian dei Morti, 1.VIII.2003 1♂ 1☿; Punta Colomion, 17.VI.2004 1☿; Rifugio Scarfiotti, 1.VIII.2003 3☿☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 1☿. CESANA TORINESE: Sagna Longa, 15.VII.2004 1☿. CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 1☿; Frais, 27.VII.2004 1♂. CLAVIERE: 2.IX.2004 1♂. EXILLES: Rifugio Levi-Molinari, 25.VI.2004 1♂. GIAGLIONE: Colle Clapier, 14.VII.2005 1☿. MONT CENIS (France): Fort Variselle, 8.VII.2003 2☿☿; Mont Malamot**, 8.VII.2003 1♂; Piano San Nicolao, 22.VIII.2002 1☿. OULX: C. Pourachet, 29.VI.2004 1☿; Grotta dei Saraceni, 23.VII.2004 1☿. SALBERTRAND: Colle Blegier, 13.VII.2004 1♀ 1☿. SAUZE DI CESANA: Argentera, 15.VII.2004 2☿☿; Valle del Gran Mioul, 15.VII.2004 1☿. SAUZE D'OULX: Lago Nero, 13.VII.2004 1☿; Notre Dame des Broussailles, 13.VII.2004 2☿☿. USSEAUX: Madonna del Dente, 25.VII.2003 2♂♂ 1☿. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 2♀♀ 6☿☿. VENAUS: Grangia della Vecchia, 27.VII.2004 2☿☿; Rio Tillirei, 27.VII.2004 1☿.

Subgenus *ALPINOBOMBUS* Skorikov 1914

Bombus alpinus ssp. *helleri* Dalla Torre 1882
BARDONECCHIA: Lago Patarè, 1.VIII.2003 1☿; Lago Sommeiller, 1.VIII.2003 5♂♂; Pian dei Frati, 1.VIII.2003 1☿; Strada per il Sommeiller, 1.VIII.2003 1♀; Vallon du Fond*, 11.VII.2006 2☿☿; Vallon du Fond**, 11.VII.2006 1♂ 1☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 1☿. GIAGLIONE: Colle Clapier, 14.VII.2005 5☿☿; Rio Clapier, 14.VII.2005 4☿☿; MONT CENIS (France): Fort Variselle, 8.VII.2003 1☿; Mont Malamot*, 8.VII.2003 3☿☿. OULX: Rochers de l'Aigle, 23.VII.2004 1♂. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 1☿.

Subgenus *BOMBUS* Latreille 1802

Bombus cryptarum ssp. *reinigianus* Rasmont 1984
CESANA TORINESE: Lago Fontana Fredda, 15.VII.2004 1☿. CLAVIERE: 2.IX.2004 1♂. OULX: Monte Genevris, 13.VII.2004 1☿. PRAGELATO: Lago dell'Assietta, 13.VII.2004 1☿. SALBERTRAND: Colle Blegier, 13.VII.2004 1☿. SESTRIERE: Plagnols, 2.IX.2004 1♂. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 1☿; Vallon de Tavernette, 9.VII.2004 1☿.

Bombus lucorum ssp. *lucorum* (L. 1761)
BARDONECCHIA: Lago Patarè, 1.VIII.2003 1♂ 3☿☿; Lago Sommeiller, 1.VIII.2003 1☿; Les Arnauds, 9.VII.2004 3♂♂; Monte Jafferau, 23.VII.2004 1♂ 3☿☿; Pian dei Frati, 1.VIII.2003 5☿☿; Punta Colomion, 17.VI.2004 1☿; Rochemolles, 2.IX.2004 1♂ 1☿; Strada per il Sommeiller, 1.VIII.2003 7☿☿; Vallon du Fond*, 11.VII.2006 3☿☿; Vallon du Fond**, 11.VII.2006 5☿☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 3♂♂ 2☿☿. CESANA TORINESE: Lago Fontana Fredda, 15.VII.2004 2☿☿. CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 2♂♂; Frais, 27.VII.2004 1♀1♂ 1☿. CLAVIERE: 2.IX.2004 1♂ 1☿. CONDOVE: Colombardino, 30.VI.2005 2☿☿; Mollette, 31.V.2002 1☿; Prarotto, 18.VI.2002 1♀, 3.VII.2002 1☿; Punta Sbaron, 30.VI.2005 1☿. EXILLES: Colle dell'Assietta, 13.VII.2004 1☿; Rifugio Levi-Molinari, 25.VI.2004 1☿. GIAGLIONE: Colle Clapier, 14 VII 2005 1☿ Rio Clapier, 14.VII.2005 6☿☿. GRAVERE: Pian Gelassa, 19.VI.2003 1☿; Punta del Mezzodì, 25.VII.2003 1♂ 1☿. MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 5☿☿, 25.VI.2003 4☿☿, 25.VII.2003 2♂♂ 2☿☿; Corbolej, 31.V.2002 1☿; Piano del Tiraculo, 17.VII.2002 1♂. MON-

PANTERO: Il Trucco, 17.VII.2002 2☿☿; La Riposa, 22.VIII.2002 1♂; Monte Palon*, 18.VII.2003 3☿☿. MONCENISIO: Ferrera Cenisio, 15.VI.2001 1☿. MONT CENIS (France): Fort Variselle, 8.VII.2003 1☿; Gran Scala, 3.VII.2002 1♀ 1☿, 22.VIII.2002 1☿; Mont Malamot*, 8.VII.2003 5☿☿; Piano San Nicolao, 29.VI.2001 1♀, 22.VIII.2002 1☿, 19.VI.2003 1☿; Plan des Fontainettes, 28.VIII.2001 1♀, 22.VIII.2002 3♂♂ 5☿☿. MONTGENÈVRE (France): Col de Montgenèvre, 2.IX.2004 3☿☿. NOVALESA: 20.IX.2001 1♀. OULX: Col Basset, 23.VII.2004 2♂♂ 2☿☿; Monte Genevris, 13.VII.2004 1☿; Salvoulx, 2.IX.2004 1☿; Vazon, 29.VI.2004 1☿. PRAGELATO: Lago dell'Assietta, 13.VII.2004 2☿☿. SALBERTRAND: Colle Blegier, 13.VII.2004 2♂♂ 3☿☿; Forte Pramand, 25.VI.2004 3☿☿. SAN GIORIO DI SUSA: Malpasso, 24.VII.1984 1☿, 15.VIII.1985 1♂. SAUZE DI CESANA: 2.IX.2004 6♂♂ 3☿☿; Grange Sises, 2.IX.2004 1☿. SAUZE D'OULX: Colle di Costa Piana, 13.VII.2004 1☿. SESTRIERE: Plagnols, 2.IX.2004 1♂ 2☿☿. USSEAUX: Colle delle Finestre, 25.VII.2003 1♂ 1☿; Madonna del Dente, 25.VII.2003 2♀♀ 4♂♂; Monte Pintas, 25.VI.2003 4☿☿, 25.VII.2003 1☿. VALLÉE ETROITE (France): Grange di Valle Stretta, 17.VI.2004 1☿; Vallon de Tavernette, 9.VII.2004 1☿. VENAUS: Grangia della Vecchia, 27.VII.2004 3♂♂; Rio Tillirei, 27.VII.2004 2♂♂; Torrente Clanero, 27.VII.2004 1♂. VILLAR DORA:Torre del Colle, 26.III.2001 2♀♀.

Bombus terrestris ssp. *terrestris* (L. 1758)

AVIGLIANA: Drubiaglio, 27.VII.1984 1♂, 12.VIII.1984 1☿, 28.VI.1985 1☿, 12 VII 1985 1☿, 4.VIII.1985 1☿, 7.VIII.1985 1☿, 9.VIII.1985 1☿, 31.VIII.1985 1♂ 1☿. BARDONECCHIA: Lago Patarè, 1.VIII.2003 1☿; Punta Colomion, 17.VI.2004 1☿; Strada per il Sommeiller, 1.VIII.2003 1☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 1♂ 1☿. CAPRIE: 28.VI.1985 1☿, 30.VIII.1985 1☿; Novaretto, 19.IV.2002 2♀♀. CHIANOCCO: 19.IV.2002 1☿; Grangia Pianfè, 31.V.2002 3☿☿; Pavaglione, 3.VII.2002 4☿☿. CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 2♂♂ 1☿. CONDOVE: Bertolere, 31.V.2002 2☿☿; Frassinere, 20.V.2003 1☿; Mollette, 31.V.2002 1☿; Prarotto, 18.VI.2002 2♂♂ 1☿. GIAGLIONE: Cresto, 20.V.2003 1☿; Forte, 14.V.2002 2☿☿; Pra Piano, 20.V.2003 1♀. MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 1♂ 1☿, 25.VII.2003 2♂♂ 3☿☿; Corbolej, 14.V.2002 1☿. MOMPANTERO: Alpe Arcella*, 18.VII.2003 2☿☿; La Riposa, 17.VII.2002 3♂♂ 3☿☿; Monte Palon*, 18.VII.2003 1♂ 2☿☿; Monte Palon**, 18.VII.2003 1♂. MONCENISIO: Ferrera Cenisio, 15.VI.2001 2☿☿. MONT CENIS (France): Gran Scala, 22.VIII.2002 1♂; Mont Malamot*, 8.VII.2003 1☿; Piano San Nicolao, 19.VI.2003 1☿. NOVALESA: 15 VI 2001 1☿, San Rocco, 14.V.2002 3☿☿. OULX: 22.IV.1993 1♀; Monfol, 22.IV.1993 1♀; Savoulx, 2.IX.2004 1☿. PRAGELATO: Lago dell'Assietta, 13.VII.2004 2☿☿. RUBIANA: Favella, 13.VII.1973 1♂. SALBERTRAND: Forte Pramand, 25.VI.2004 4☿☿. SAN GIORIO DI SUSA: Malpasso, 9.VIII.1985 1☿. SAUZE D'OULX: Colle di Costa Piana, 13.VII.2004 1☿. USSEAUX: Colle della Vecchia 25 VI 2003 1☿; Colle delle Finestre, 25.VII.2003 2♂♂; Madonna del Dente, 25.VII.2003 2♂♂ 1☿; Monte Pintas, 25.VI.2003 1☿. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 1☿; Vallon de Tavernette, 9.VII.2004 1☿. VENAUS: 31.V.2002 2☿☿; Rio Tillirei, 27.VII.2004 1♂. VILLAR DORA: 26.III.1977 1♀, 20 IV 1977 1☿.

Subgenus *ALPIGENOBOMBUS* Skorikov 1914

Bombus wurflenii ssp. *mastrucatus* (Gerstaecker 1869)

BARDONECCHIA: Lago Patarè, 1.VIII.2003 1☿; Pian dei Frati, 1.VIII.2003 2☿☿; Pian dei Morti, 1.VIII.2003 1♂ 1☿; Punta Colomion, 17.VI.2004 1☿; Strada per il Sommeiller, 1.VIII.2003 1☿. MOMPANTERO: La Riposa, 22.VIII.2002 1☿. MONCENISIO: Ferrera Cenisio, 7.VIII.1976 1♂. MONT CENIS (France): Barrage, 3.VII.2002 1♀ 1☿; Cumba di Crevacuore, 8.VII.2003 1☿; Fort Variselle, 8.VII.2003 2☿☿; Lac de Rotherel, 19.VI.2003 1☿; Mont Malamot*, 8.VII.2003 1☿; Piano San Nicolao, 19.VI.2003 4☿☿; Plan des Fontainettes, 22.VIII.2002 7♂♂ 7☿☿. SAUZE DI CESANA: 2.IX.2004 1☿.

Subgenus *MELANOBOMBUS* Dalla Torre 1880

Bombus lapidarius ssp. *lapidarius* (L. 1758)

AVIGLIANA: Drubiaglio, 23.VII.1985 1☿. BARDONECCHIA: Les Arnauds, 17.VI.2004 1♀, 9.VII.2004 1☿; Passo dei Fourneaux settentrionale, 11.VII.2006 1☿; Pian dei Frati, 1.VIII.2003 2☿☿; Strada per il Sommeiller, 1.VIII.2003 1☿. BUSSOLENO: Colle della Croce di Ferro, 18.VII.2003 1☿. CAPRIE: Novaretto, 19.IV.2002 1☿. CHIANOCCO: Grangia Pianfé, 31.V.2002 2♀♀ 1☿. CHIOMONTE: Cima Ciantiplagna, 25.VII.2003 3☿; Frais, 27.VII.2004 3♂♂. CLAVIERE: 2.IX.2004 1♂. CONDOVE: Bertolere, 31.V.2002 1☿; Colle del Colombardo, 30.VI.2005 3☿; Prarotto, 31.V.2002 2♀♀, 18.VI.2002 4♀♀ 1☿, 3.VII.2002 1♀ 1♂; Tomba di Matolda, 30.VI.2005 1☿. GIAGLIONE: Colle Clapier, 14.VII.2005 2☿☿; Sant'Andrea, 20.V.2003 1☿. GRAVERE: Punta del Mezzodì, 25.VII.2003 1☿. MATTIE: Giordani, 25.V.2001 1♀. MEANA DI SUSA: Colle delle Finestre, 25.VI.2003 1☿, 25.VII.2003 2☿☿. MONPANTERO: Alpe Arcella*, 18.VII.2003 2☿☿; Il Trucco, 20.V.2003 1☿; La Riposa, 17.VII.2002 2♀♀ 3☿☿; Monte Palon**, 18.VII.2003 1☿. MONT CENIS (France): Gran Scala, 22.VIII.2002 1♂; Grand-Croix, 18.VI.2002 1♀; Mont Malamot*, 8.VII.2003 1☿; Piano San Nicolao, 15.VI.2001 1♀; Plan des Fontainettes, 22.VIII.2002 1☿. NOVALESA: 15.VI.2001 1♀ 1☿, 29.VI.2001 1♀, 18.VI.2002 1♀. OULX: Grotta dei Saraceni, 23.VII.2004 2☿☿; Vazon, 29 VI 2004 1♀. PRAGELATO: Lago dell'Assietta, 13.VII.2004 1☿. SALBERTRAND: Forte Pramand, 25.VI.2004 1☿. SAUZE DI CESANA: 2.IX.2004 1♂. SAUZE D'OULX: Richardette, 13.VII.2004 1☿. USSEAUX: Madonna del Dente, 25.VI.2003 1☿, 25.VII.2003 2☿☿; Monte Pintas, 25.VI.2003 1☿, 25.VII.2003 1☿. VENAUS: 31.V.2002 1♀; Fondo di Bar, 31.V.2002 2♀♀, 18.VI.2002 1♀; Rio Tillirei, 27.VII.2004 1☿. VILLAR DORA: 20.IV.1977 1♀.

Bombus sichelii ssp. *flavissimus* Tkalcu 1974

BARDONECCHIA: Lago Patarè, 1.VIII.2003 2☿☿; Pian dei Frati, 1.VIII.2003 3♂♂ 1☿; Pian dei Morti, 1.VIII.2003 1♂ 1☿; Rifugio Scarfiotti, 1.VIII.2003 5☿☿. CLAVIERE: 2.IX.2004 1☿. MEANA DI SUSA: Colle delle Finestre, 17.VII.2002 1☿. MOMPANTERO: La Riposa, 22.VIII.2002

1♂. MONT CENIS (France): Fort Variselle, 8.VII.2003 2☿☿; Gran Scala, 3.VII.2002 1☿, 22.VIII.2002 2♂♂; Plan des Fontainettes, 22.VIII.2002 2♂♂ 4☿☿. MONTGENÈVRE (France): Col de Montgenèvre, 2.IX.2004 1☿. SAUZE DI CESANA: Valle del Gran Mioul, 15.VII.2004 1♀. USSEAUX: Monte Pintas, 25.VI.2003 1☿, 25.VII.2003 1☿. VALLÉE ETROITE (France): La Grosse Somme, 9.VII.2004 1♀ 1☿. VENAUS: Grangia della Vecchia, 27.VII.2004 1☿.

Discussion and conclusions

The bumble bee species in the Susa Valley account for 70% of those known in Italy, demonstrating the value of the examined area with regard to environmental quality and biodiversity. This is very important and significant because of the primary role played by bumble bees in maintaining the ecosystem through their pollinating activity. It is therefore disconcerting that so far the information on the bumble bee fauna of the valley was scarce and fragmentary (table 4), even taking into account the reports by Comba (1972) on the side of Colle delle Finestre facing the Chisone Valley.

All the species collected in the Susa Valley, except *B. maxillosus*, were already known from Piedmont (Intoppa *et al*., 1995), but 16 are reported now for the first time for the valley. On the contrary, *Bombus inexspectatus* (Tkalcu), *Bombus barbutellus* (Kirby), and *Bombus jonellus* (Kirby) were not found during the present investigation, while they had been recorded by previous researchers (table 4); the first species, extremely rare, seems to have a parasitic behaviour upon *B. ruderarius* (Müller, 2006), the second one parasitizes the nests of *B. hortorum*, not particularly frequent in the Susa Valley, while the third one, mainly linked to Ericaceae, is rare in Italy (Intoppa *et al*., 1995; Barbattini, 2007) even though it could be more common than it seems (Intoppa *et al*., 1999).

It is most remarkable that *Bombus brodmannicus* Vogt was found neither in the Susa Valley nor in the contiguous "Waldensian Valleys" (Comba, 1960; 1972; Comba and Comba, 2001), while it is widespread in the French Alps (Rasmont, 1988), where it was collected also in localities a few kilometers far from the Susa Valley (Delmas, 1962; Tkalců, 1973). On the other hand, the only record of this species in Switzerland is doubtful (Amiet, 1996) and the first and only Italian records (Intoppa *et al*., 1995) are the much southern ones by Tkalců (1973) concerning two cols between Italy and France, the Col de Tende and the Colle della Maddalena; one must not forget also *Bombus pomorum* (Panzer) and *Bombus magnus* Vogt, that are present in the French Alps (Rasmont, 1988), but not in Switzerland (Amiet, 1996) neither, presently as far as we know, in Italy (Intoppa *et al*., 2009).

The distribution in Italy of the bumble bee subspecies is still uncertain due also to the presence of individuals with intermediate characters (Intoppa *et al.*, 2009); the presence of *B. pascuorum melleofacies* in the Susa Valley - a subspecies known until now only in the Italian peninsula (Rasmont, 1983) - is noteworthy, but also *Bombus pascuorum floralis* (Gmelin) has been recorded in northern Italy only lately (Barbattini *et al.*, 2007).

The scanty data on Italian bumble bee fauna suggest the outmost caution about actual species and subspecies distributions and should also foster further investigations in the large areas for which information is poor or completely lacking. Therefore it seemed preferable not to extend the comparison to other mountain ranges and neither to the outer side of the Alps, but to limit it to what is known on the Italian inner side, referring to the catalogue by Intoppa *et al*. (1995) and the subsequent studies (Intoppa *et al*., 1999; Comba and Comba, 2001; 2005; Barbattini *et al*., 2007; Manino *et al*., 2007; Cornalba, 2009). Altogether, the following differences can be pointed out: a lack of recent records for *B. alpinus* outside the Piedmont region; absence of *Bombus mucidus* Gerstaecker in Lombardy and Venetia, while it

Table 4. Bumblebee species recorded in localities of the Susa Valley by previous researchers.

	Gribodo, 1873	Comba, 1972	Pagliano, 1994
B. mendax	Colle del Moncenisio	Colle delle Finestre	
B. soroeensis		Sauze d'Oulx Colle delle Finestre	Colle delle Finestre
B. humilis			Monte Musinè
B. inexspectatus		Colle delle Finestre	
B. mesomelas		Sauze d'Oulx	Colle delle Finestre
B. ruderarius		Colle delle Finestre	Pietrabianca di Bussoleno
B. barbutellus		Colle delle Finestre	
B. bohemicus			Pietrabianca di Bussoleno
B. flavidus			Sauze d'Oulx
B. quadricolor		Sauze d'Oulx	
B. rupestris		Colle delle Finestre	
B. sylvestris		Colle delle Finestre	
B. vestalis		Sauze d'Oulx	
B. jonellus	Susa surroundings		
B. monticola			Sauze d'Oulx
B. pratorum		Sauze d'Oulx	
B. lucorum		Sauze d'Oulx	

is rare in Friuli-Venezia Giulia; the absence of *B. mendax* and *B. sichelii* and a relative rarity of *B. pyrenaeus* in Venetia and Friuli-Venezia Giulia, while they are rather common both in Piedmont and Lombardy. On the contrary, in addition to the above mentioned *B. hortorum*, also *Bombus hypnorum* (L.), *B. humilis*, and, at least for Friuli-Venezia Giulia, *B. sylvarum* seem less common in the Susa Valley than elsewhere. The presence of the subgenus *Psithyrus* is instead everywhere quite low and obviously in relation to that of the bumble bee species they are nest-parasites of.

The altitudinal distribution of the species, highlighted in the Susa Valley, is broadly in agreement with what was recently detected in Lombardy by Intoppa *et al*. (1999) in the Adamello Natural Park, located in the Adamello-Presanella-Alps (Marazzi, 2005), and by Cornalba (2009) in the upper Val Brembana, located in the Orobie Alps (Marazzi, 2005). Of the 21 species found in the three territories, which have rather different geomorphological and vegetational characteristics, only *B. soroeensis* and *B. lapidarius* reach, and in a not insignificant number, remarkably higher elevations in the Susa Valley. When comparing, however, the distribution of species and their abundance at various altitudinal belts as emerged from this investigation with what was observed between 1946 and 1970 in the "Waldensian Valleys" (Comba and Comba, 2001), it is clear that in the Susa Valley about half of the 25 species that are common to both areas, are present in great numbers at a significantly higher elevation; besides for *B. soroeensis* and *B. lapidarius*, which have already been mentioned earlier, and *B. mendax*, *B. monticola*, and *B. alpinus*, which were already dealt with elsewhere (Manino *et al*., 2007), the phenomenon is particularly evident for *B. mesomelas*, *B. ruderarius*, and *B. terrestris*, although the last species, in comparison to *B. lucorum*, remains more abundant at lower elevations. Also taking into account the differences between the different areas, the different sampling methods adopted in the mentioned studies, and the significant spatio-temporal variation naturally found in bee populations (Roubik, 2001; Williams *et al.*, 2001; Petanidou *et al.*, 2008), we could in any case put forward the hypothesis – to be verified through proper investigations – that the colonization of the summit areas in being taking place by species once confined to lower elevations; a similar phenomenon has been recently reported for *B. terrestris* and *B. lapidarius* in Scotland (Macdonald, 2001). Anyway, all the considerations concerning species of the subgenus *Bombus sensu stricto* should be taken into account cautiously because the relative specimens were assigned to each species by means of morphological characters only following the indications by Intoppa *et al*. (2009); the taxonomic complexity of this subspecies and the relative difficulties to identify the single species were recently summarized by Murray *et al.* (2008) and De Meulemeester *et al*. (2009), who adopted, respectively, some molecular or morphometrical approaches to solve this problem.

All *Bombus* species found in the Susa Valley are polylectic, as shown by the data of the plants on which they were collected. They tend to prefer the same plant families already reported by other authors (i.e. Alford, 1975; Rasmont, 1988; Benton, 2006; Iserbyt *et al.*, 2008). The poor number of observations and the lack of data regarding the relative abundance/area covered by the flora where and when the bumble bees were collected do not permit to draw meaningful conclusions about the botanical preferences of the rare species or even of the common ones; for the eight predominant species it seems instead evident that, though they visit mostly the more abundant plant genera in their foraging areas, they show remarkably different preferences, even if not always in line with what was pointed out by other authors. In particular, we must underline that, as it was already pointed out by Rasmont (1988), *B. soroeensis* visits the Campanulaceae much more assiduously than the other species.

Without sufficiently comprehensive data on the past presence of bumble bees in the Susa Valley, it is impossible to establish if there has been a decrease in the number of species present in the valley and/or a shrinking in number or area, but hints of the occurrence of this phenomenon do exist. The global climatic change that is taking place and the consequent vegetation changes pose however a serious threat also to bumble bee communities; in particular a further increase in temperature would mean that the distribution area of the typical high mountain species would go through a drastic reduction and fragmentation that could seriously impair their survival.

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